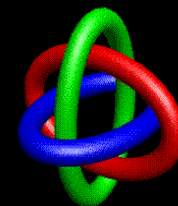


# Electronic Notebooks (Collaboratories)

**James D. Myers**

**EMSL Collaboratory Project**

**Pacific Northwest  
National Laboratory**



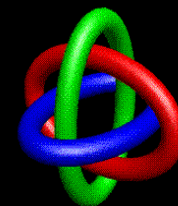
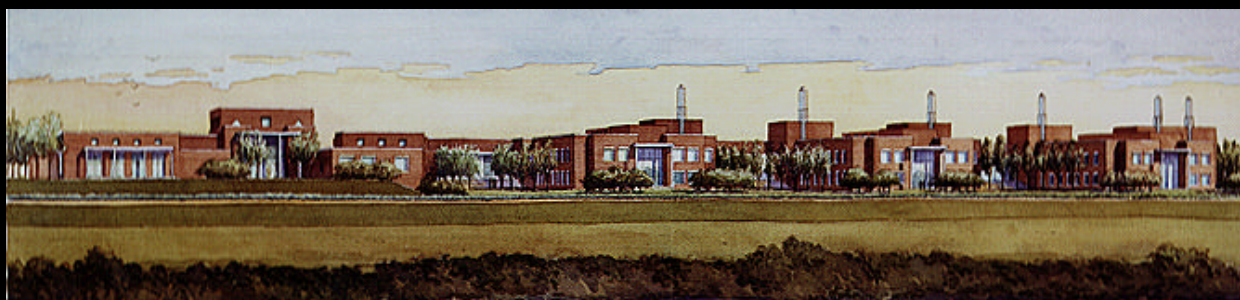
**DOE2000**

**(Real-time)  
Collaboration  
Management**

**Collaboratory  
Interoperability  
Framework**

**Electronic  
Notebooks**

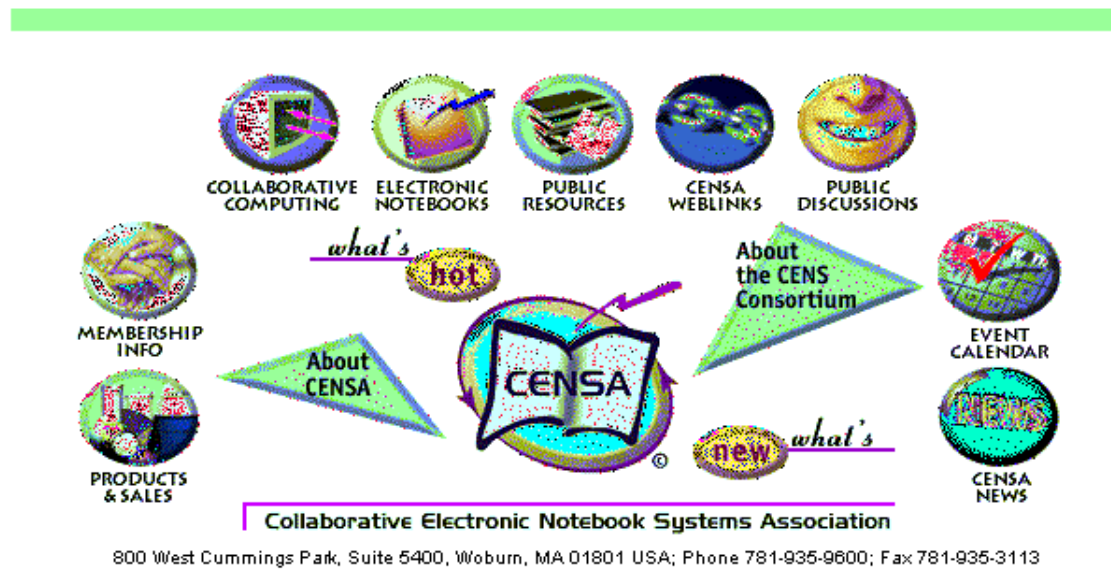
**Shadow Pilot:  
Environmental Molecular Sciences Laboratory  
Pacific Northwest National Laboratory**



# Collaborative Electronic Notebook Systems Association (CENSA)

Rich Lysakowski - [www.censa.org](http://www.censa.org)

**Chemical and Pharmaceutical companies promoting  
the development of commercial EN systems**



The image shows a navigation menu for the Collaborative Electronic Notebook Systems Association (CENSA). At the center is a logo featuring an open book with the word "CENSA" on it, surrounded by a circular border. Above the logo, five circular icons represent different services: Collaborative Computing, Electronic Notebooks, Public Resources, CENSA Weblinks, and Public Discussions. Below the logo, five circular icons represent: Membership Info, Products & Sales, About CENSA, About the CENSA Consortium, and Event Calendar. To the right of the logo, there are two more circular icons: CENSA News and a "what's new" button. The text "Collaborative Electronic Notebook Systems Association" is written below the logo. At the bottom, the address "800 West Cummings Park, Suite 5400, Woburn, MA 01801 USA; Phone 781-935-9600; Fax 781-935-3113" is provided. A banner at the bottom left reads ".... Software Engineering .... Patenting in Cyberspace .... Intellectual". A "Consortium Members Only" button is located at the bottom right, next to a stylized knot logo.

COLLABORATIVE COMPUTING ELECTRONIC NOTEBOOKS PUBLIC RESOURCES CENSA WEBLINKS PUBLIC DISCUSSIONS

MEMBERSHIP INFO PRODUCTS & SALES About CENSA About the CENSA Consortium EVENT CALENDAR CENSA NEWS

Collaborative Electronic Notebook Systems Association

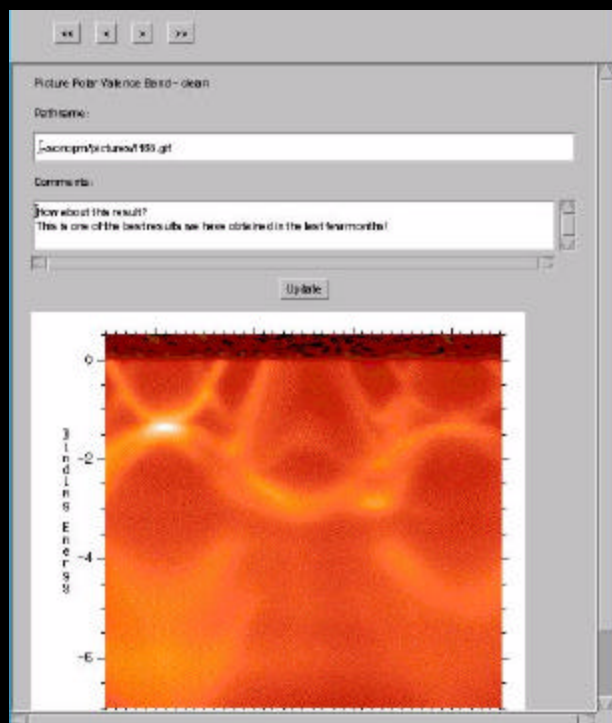
800 West Cummings Park, Suite 5400, Woburn, MA 01801 USA; Phone 781-935-9600; Fax 781-935-3113

.... Software Engineering .... Patenting in Cyberspace .... Intellectual

Consortium Members Only

# DOE2000 Electronic Notebook Project

ORNL



LBNL

Contents - Netscape

ew Go Window Help

Forward Reload Home Search Guide Print Security Stop

Location: nta/cgi-bin/group/enote.cgi?nb=group&action=loc&page=29

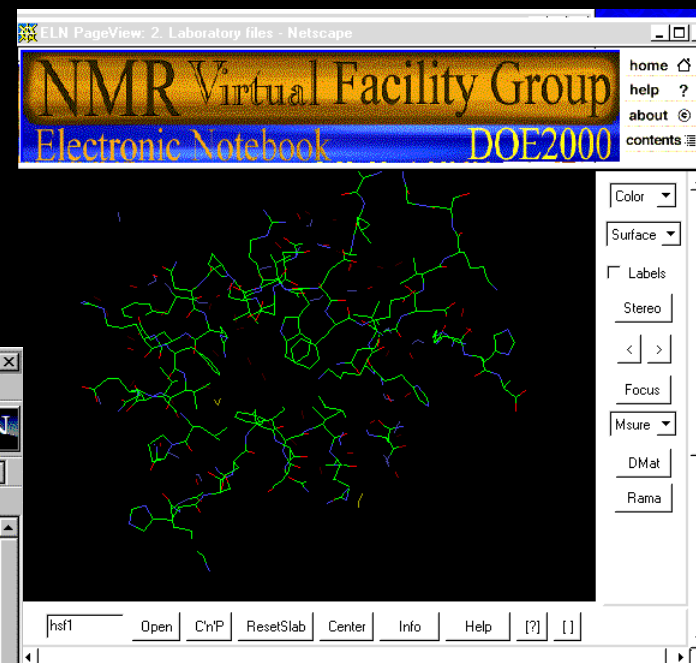
et Lookup New&Cool Netcaster support@emsl.pn

### Group Notebook

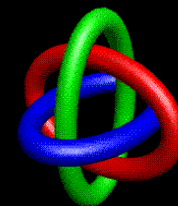
Contents

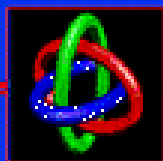
- [Electronic Notebook Proposal \(Al Geist\)](#)
- [Proposal in Postscript \(Noel Nachtigal\)](#)
- [Notebook architecture notes \(Noel Nachtigal\)](#)
- [Core notes from Berkley meeting \(Al Geist\)](#)
- [Designing Perl Prototypes \(Jim Myers\)](#)
- [Notebook Object Definition \(Sonia Sachs\)](#)
- [More Notes on Defining the Notebook Object \(Jim Myers\)](#)
- [Comments and Ideas on Basic Notebook Object \(Al Geist\)](#)
- [Notes on Basic Notebook Functions \(Al Geist\)](#)
- [bifkdj \(Al Geist\)](#)
- [Editor API Document \(Jim Myers\)](#)
- [Editor API with Picture \(DRAFT\) \(Jim Myers\)](#)
- [Modular Engine Design \(Al Geist\)](#)
- [Notebook object java source \(Jim Myers\)](#)
- [Editor API \(Jim Myers\)](#)
- [Client API \(Jim Myers\)](#)

Document: Done

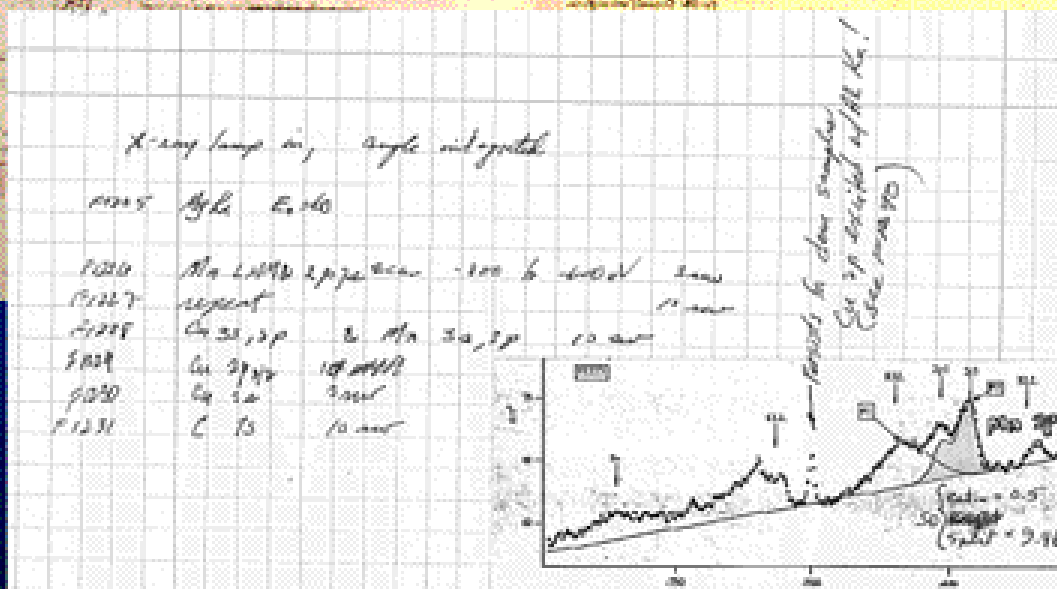
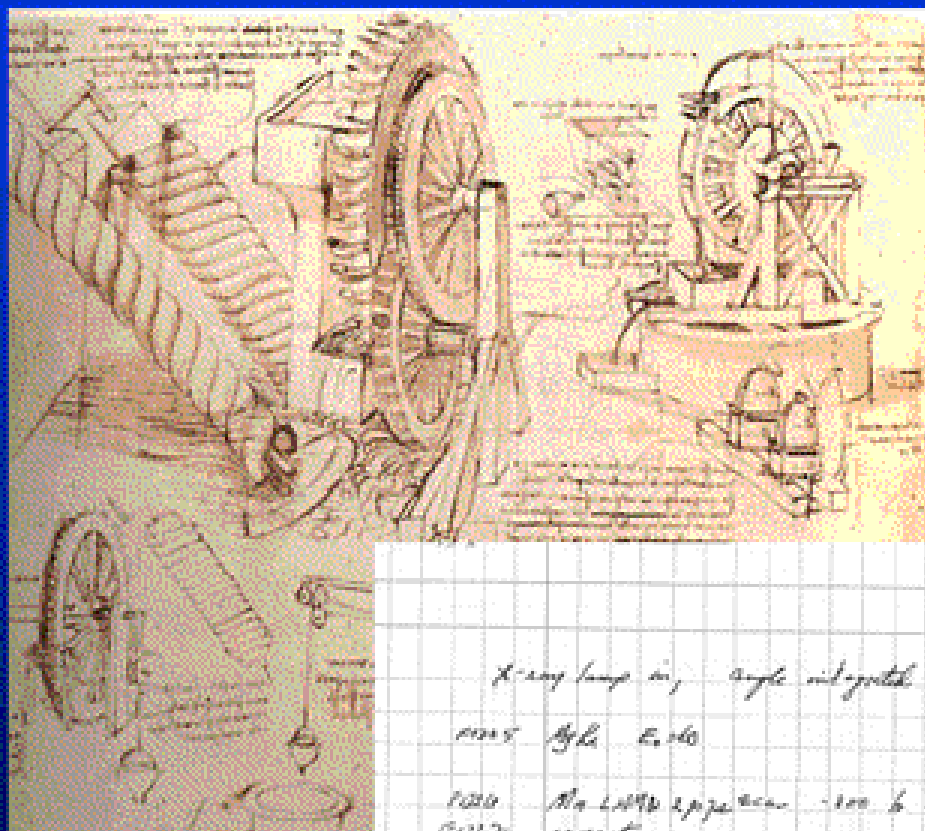


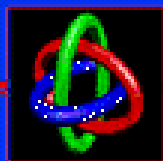
PNNL





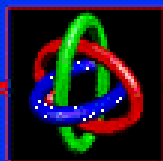
# Laboratory Notebooks: The Heart of Scientific Research





## **Types of Notebooks / Purposes of a Notebook**

- Researcher's Laboratory Notebook (Scientific Observations)
- Design Notebook (New Ideas)
- Instrument Log Book (Maintenance)
- Experiment Log Book (Time/Cost Accounting)
- Legal Record
  - Invention Reports (Intellectual Property)
  - Sample Tracking
- Notepad
- Group Workspace



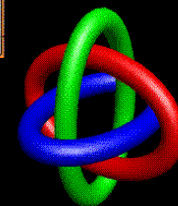
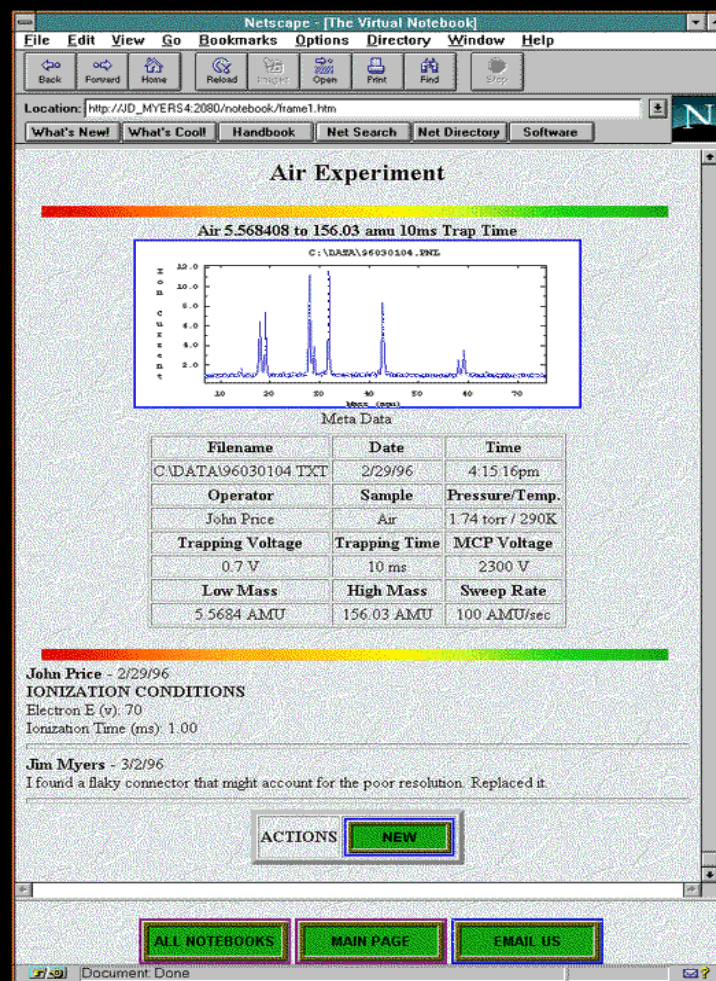
## Sources of Notebook Information

- Instruments, Analysis / Visualization / Modeling Software
  - Data files / Results files in 'native' format (lossless)
  - Summaries - Images, Tables, ... (lossy)
  - Metadata / Processing history / Parameter files
- Researchers (individual)
  - Notes - structured and unstructured text
  - Sketches / Diagrams / Schematics
- Groups
  - Presentations
  - Conversations (A/V, Whiteboard, Shared Screen, ...)



# Electronic Notebook Design

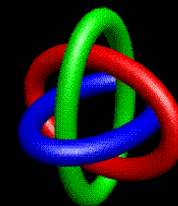
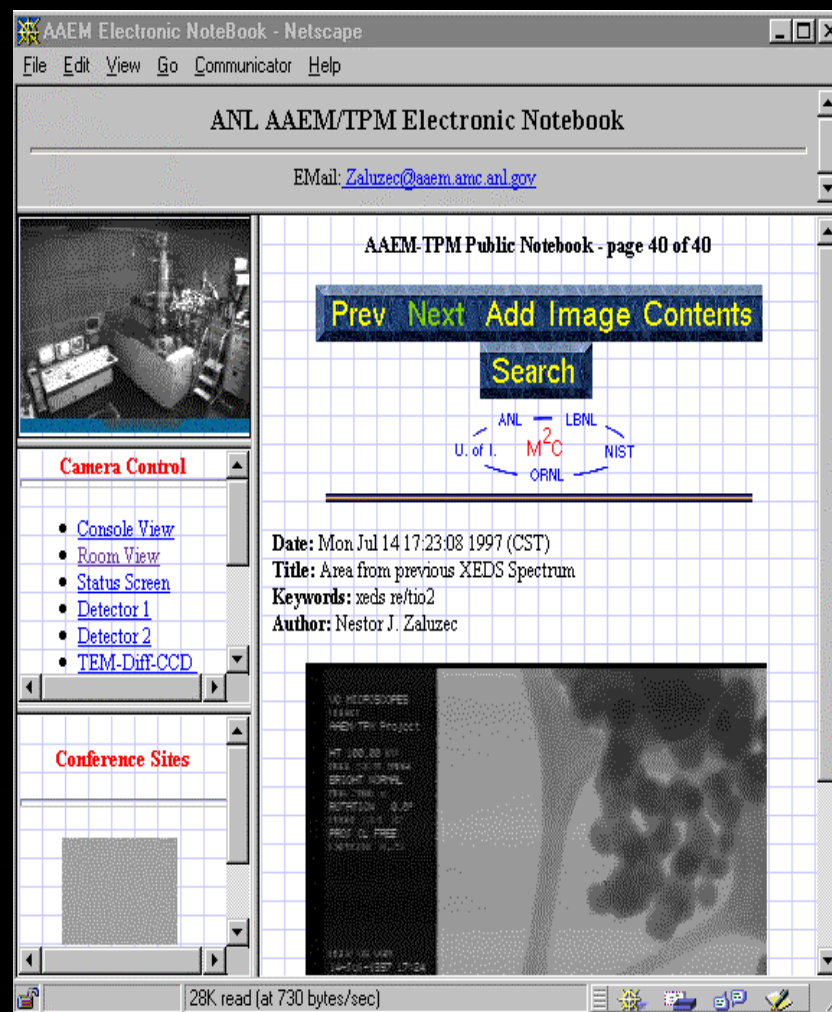
- *Securable, shared WWW based space*
- *Interactive input of results into notebook*
- *Rich media types (text, images, files, 3D structures, voice, animations, video, ...)*
- *Querying/ Searching*
- *Automation of*
  - *Data/Metadata input from instruments and calculations*
  - *Access to full datasets*





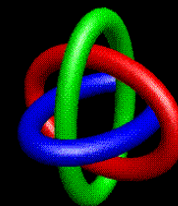
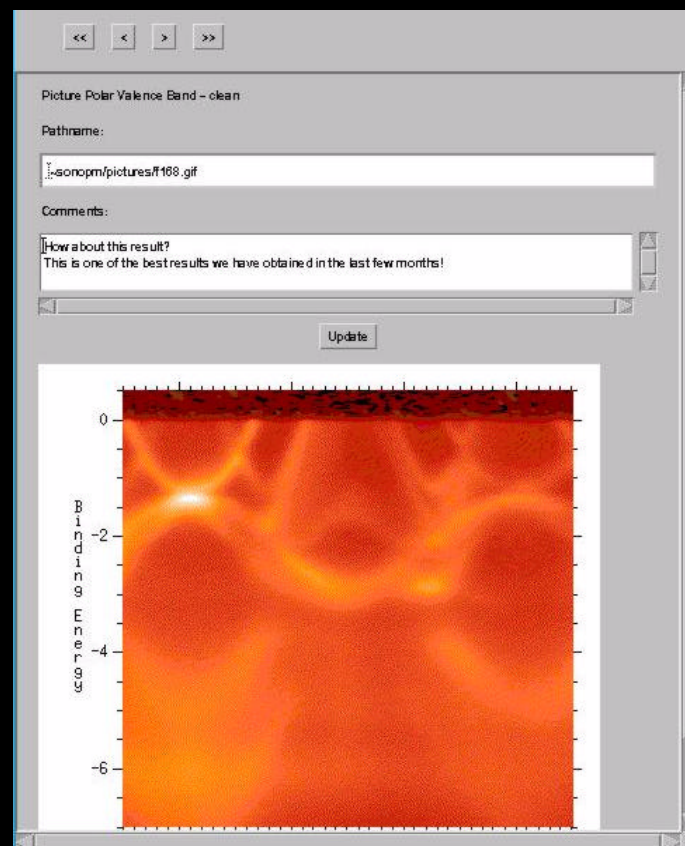
# Electronic Notebook Design

- *Modular/Extensible*
  - *New data types*
  - *New data views*
- *Digital Signatures*
- *Witnessing*
- *Timestamps*
- *Fine Grained Authorization*
- *Import/Export*



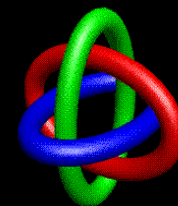
# Electronic Notebook Design

- *Notification/workflow*
- *Mobile use/  
synchronization*
- *Problem Solving  
Environment*
- *Database functionality*
  - *user definable schemas*
  - *sophisticated queries*



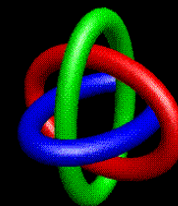
# **CENSA Issues - Legal defensibility**

- *Conversion to 'PDF'*
- *Biometric authentication*
- *Timestamp services*
- *FDA/Patent office rules*
  - *Authentication timeout*
  - *Visible signature*
- *Records Management*
  - *audit trail*
  - *archival bond*
  - *retention schedules*
  - *format migration*
  - *signature migration*
- *Modularity*



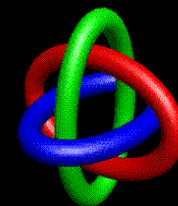
## **Aside: Preservation and Integrity of Electronic Records**

- [www.slais.ubc.ca/users/duranti](http://www.slais.ubc.ca/users/duranti)
- “Diplomatics: New Uses for an Old Science”  
**Archivia** 30 (Summer 1990) pp.5-14

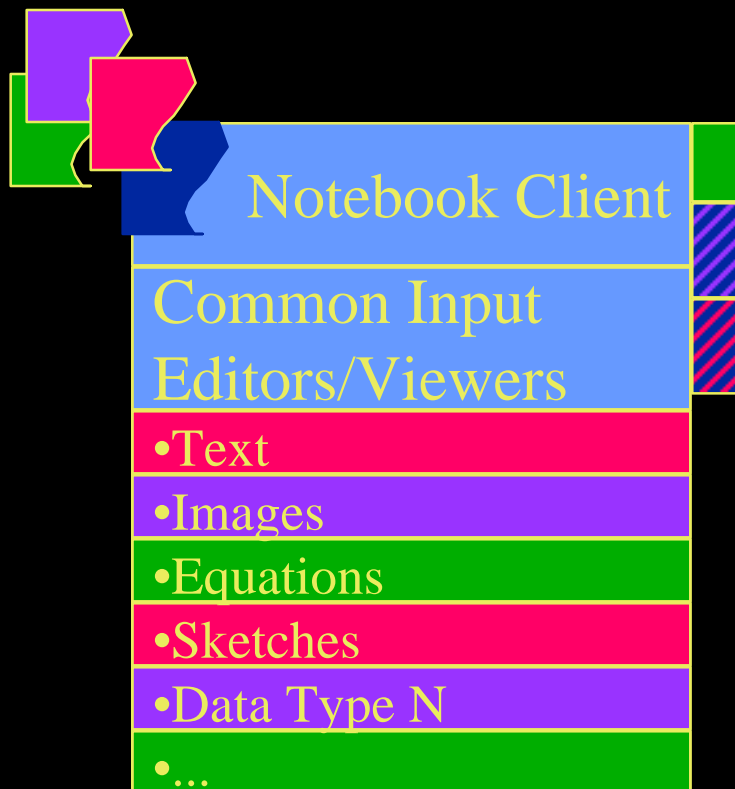
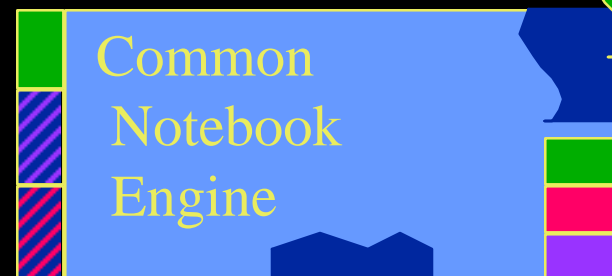
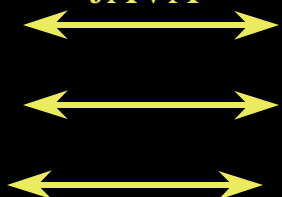


## **DOE2000 EN Approach**

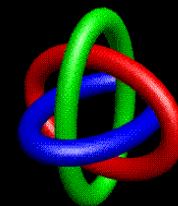
- **Started with 3 separate prototypes at 3 labs**
- **Defined common architecture and all are migrating towards it (e.g. editor interface, import/export)**
- **Providing prototypes and support now (install, docs, help, SDKs, ...)**
- **New functionality available every ~6 months**
- **Revolutionize over 3 years**



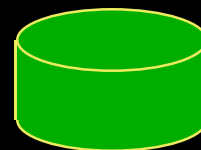
# A Common Architecture

Advanced  
FeaturesCORBA  
HTTP  
JAVAResource Discovery  
Signing  
...migrated  
Advanced  
FeaturesData Storage  
Interface

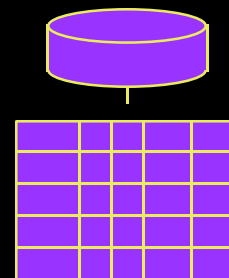
Files

Data  
Acquisition  
Systems (many)

Input interfaces (few)



ODB

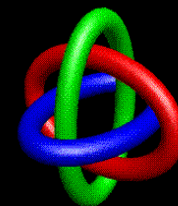


OPM/Rel

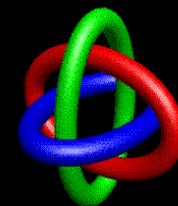
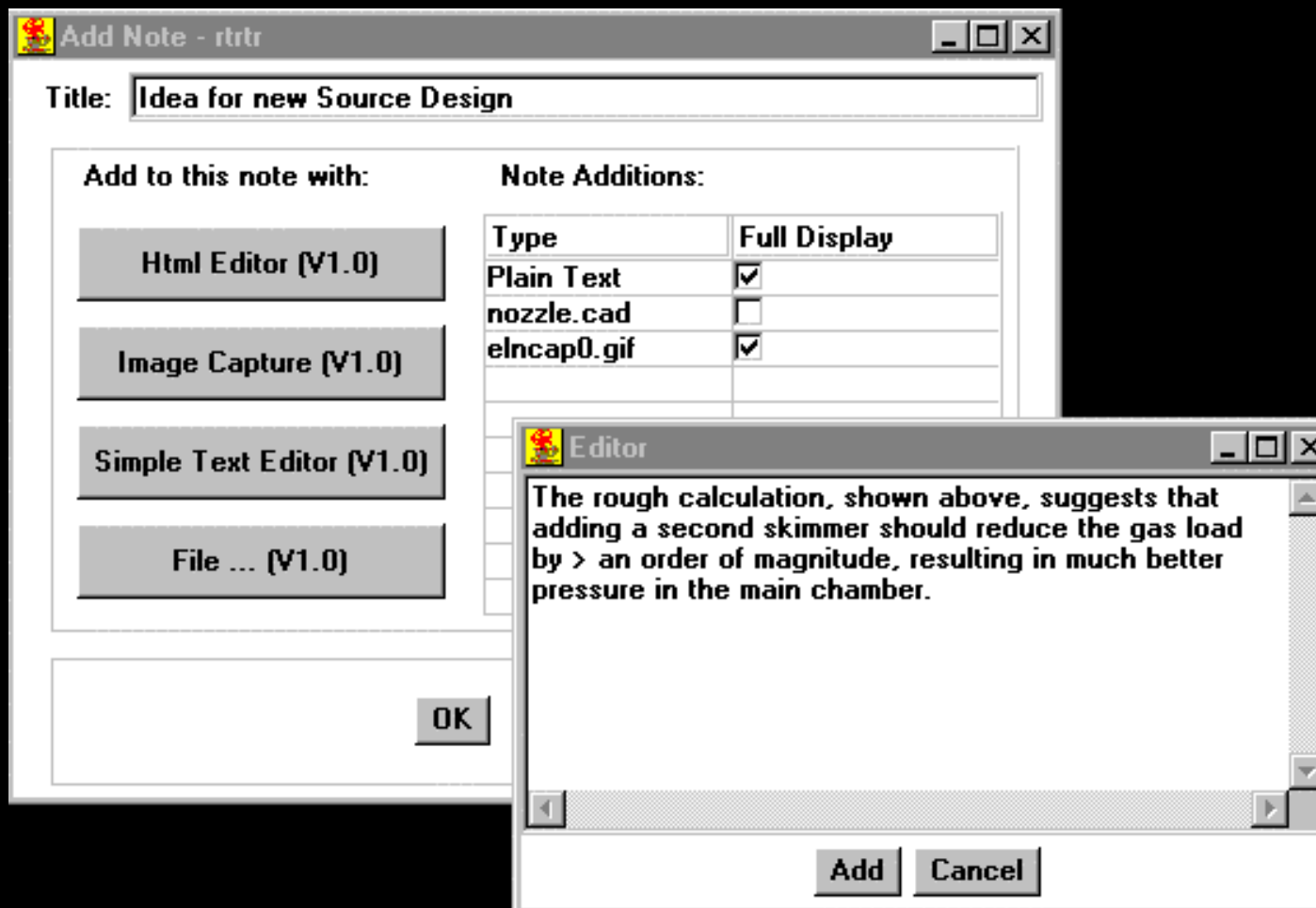


# Progress toward common Architecture

- Notebook Object Definition
- Editor API
- Common Editors (e.g. sketchpad, image capture)
- Import/Export format (MIME encoding)
- Signing format
- Viewer API
- Client-Server Protocol



# Notebook Objects and Editors



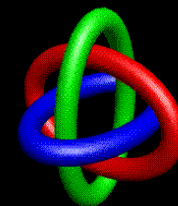
# Notebook Object Fields

## *Defined*

- **String** authorName
- **String** objectID
- **String** dateTime
- **String** label
- **MIME** dataType
- **Byte** data[]
- **URL** dataRef

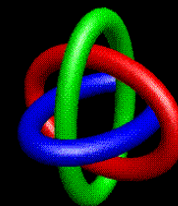
## *TBD (non-standard)*

- **Version**
- **OID**
- **Instrument ID**
- **Author Certificate**
- **Author DN**
- **NB Engine DN**
- **NB Certificate**
- **Signature - author**
- **Signature - witness**
- **Signature - timestamp**



# Can I get a notebook now?

- All three labs provide downloads, instructions, support
- Author/View
- Search
- (Editor API)
- Editor SDK
- (Import/Export)
- Instrument Interfaces (PRE/CORBA)
- Notification
- Mobile use
- SSL
- (Signing - depends on licensing)
- ...
- CENSA ERS in FY99



# Collaboratory tools

Session Manager

Lab Notebook

Colleagues

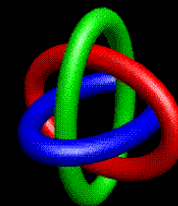
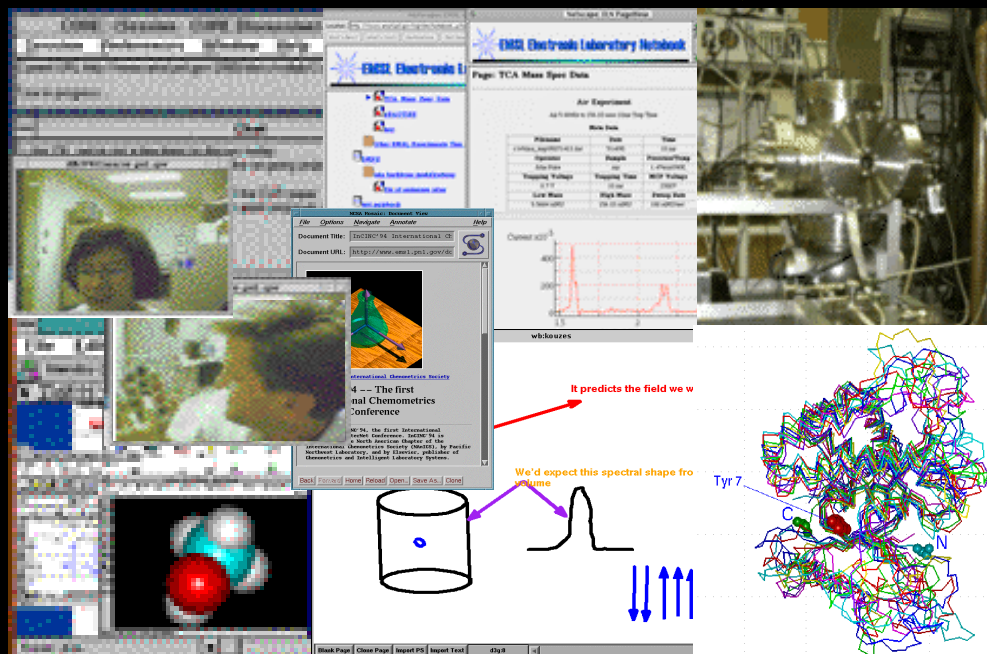
Scientific Instruments

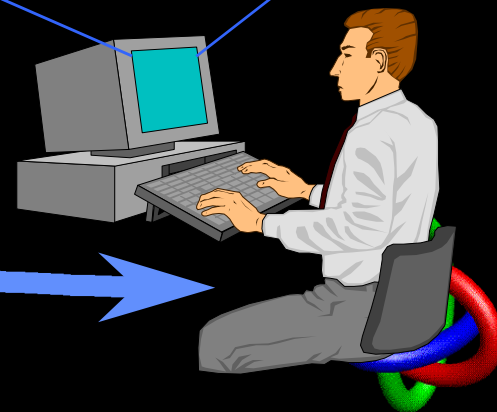
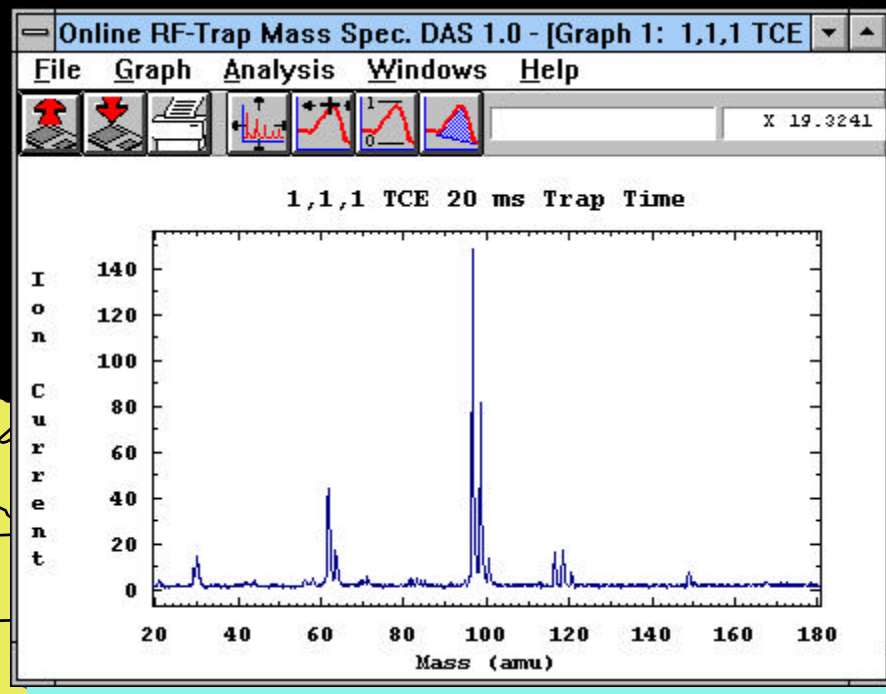
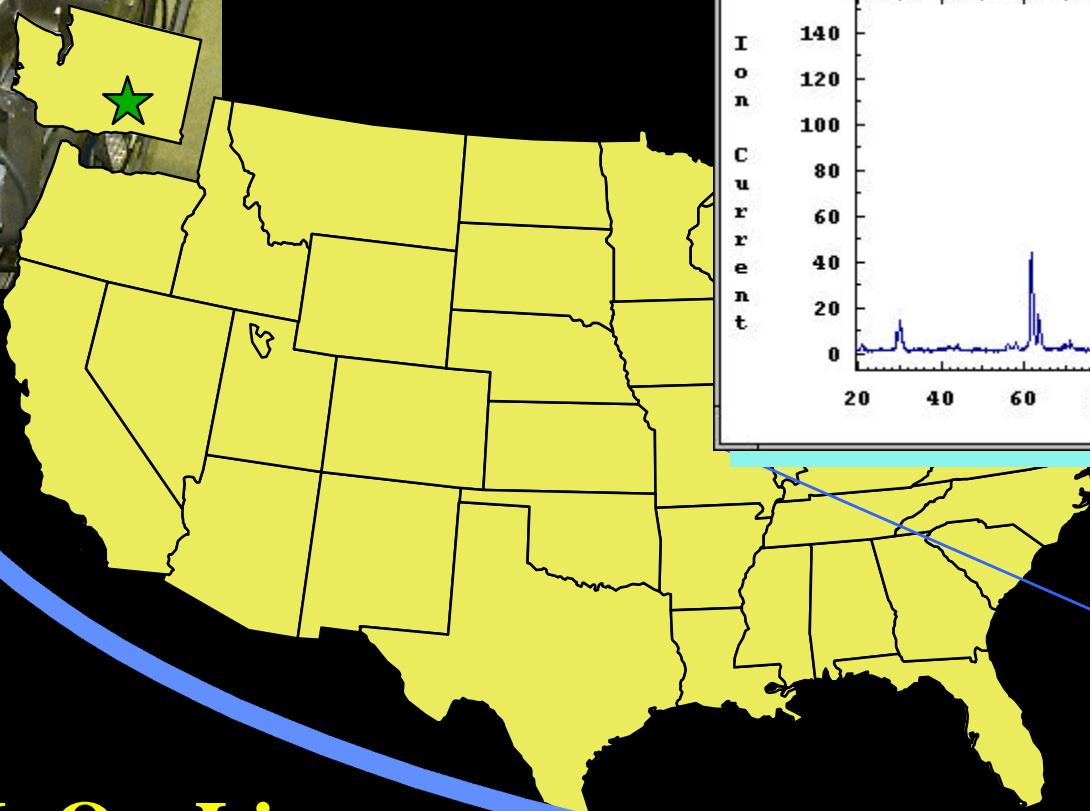
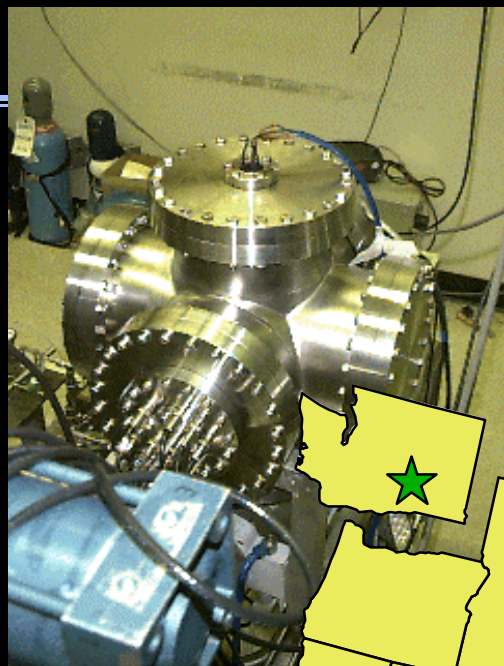
Shared Computer Display

Information Browsing

Whiteboard

Analysis Tools



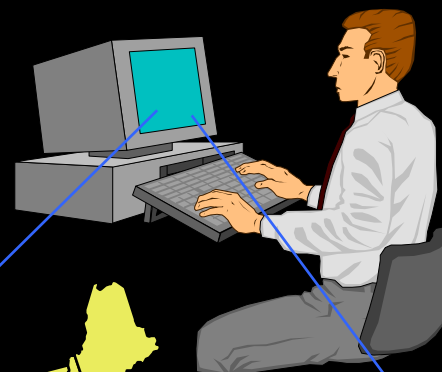


**EMSL On-Line  
RF Ion Trap Mass Spectrometer**





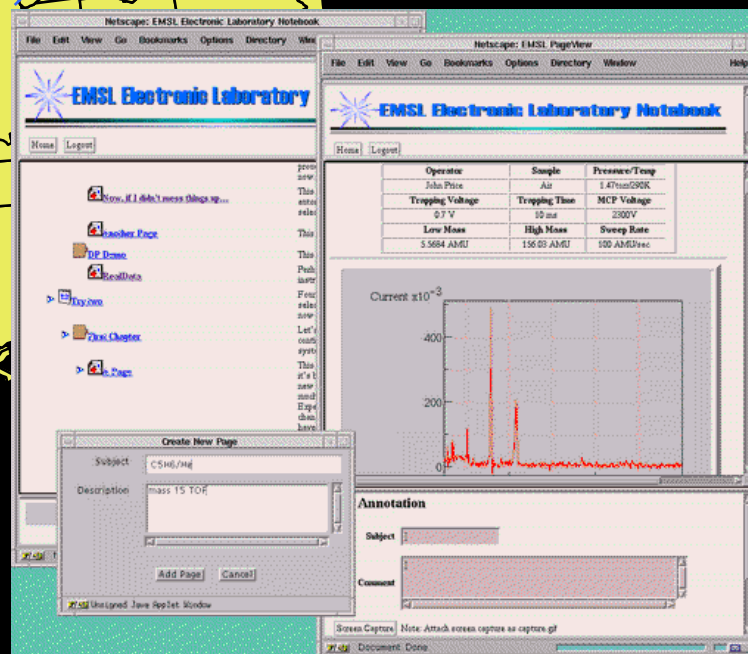
Secure WWW  
Access



EMSL  
Archiv



EMSL  
Electronic Notebook



# **CIF Enabled Collab Tools:**

*Web Registration/  
ID Request*



*Video/ data Conferencing*  
*Collaborative Instruments/ Analysis Tools*  
*Electronic Notebooks*

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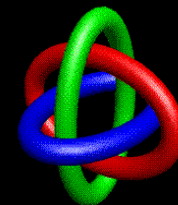
*PKI  
Authentication*

*People/  
Resource  
Information*

*Access policies*

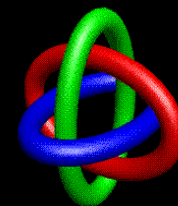
*Communications*

*Session  
Management*



## Conclusions

- **Electronic notebooks exist now, and will continue to improve**
- **Pilot users want authentication and signing**
- **Signing Design/implementation in progress (need PKI and cipher licenses for deployment)**
- **Will be able to share resource discovery, management, and security infrastructure with real-time collaboration tools and remote instruments**
- **You can only stack so many research projects**

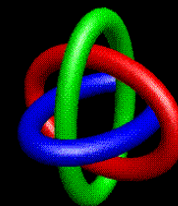


# Acknowledgments

- PNNL - Jim Myers, Elena Mendoza
- LBNL - Sonia Sachs
- ORNL - Al Geist, Noel Nachtigal
- U.S. Department of Energy
  - **Mathematical, Information and Computational Sciences Division of the Office of Energy Research**
    - » DOE2000
  - **Pacific Northwest National Laboratory (PNNL)**
    - » Laboratory Directed Research and Development (LDRD)



Pacific Northwest National Laboratory is a multiprogram national laboratory operated by Battelle Memorial Institute for the U.S. Department of Energy under Contract DE-AC06-76RLO 1830.



## Websites & email

**DOE2000** <http://www.mcs.anl.gov/DOE2000>

**DOE2000 Electronic Notebooks**

<http://www.epm.ornl.gov/enote/>

- links to LBNL, ORNL, PNNL sites (with notebook prototypes, SDKs, docs, help, ...)

**doe2000-en@emsl.pnl.gov**

**EMSL Collaboratory**

<http://www.emsl.pnl.gov:2080/docs/collab/>

